

ects That Sting . . .

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and other probing facts.

by Ramon D. Gass

Missouri Department of Conservation





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Insects That Sting . . . and other probing facts

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The Department of Conservation frequently receives questions about stinging insects. Anyone who spends much time outdoors will be exposed to these insects, and students are often interested in them for classroom assignments.

There are two orders of insects whose sting or bite can inflict excruciating pain. The first is the Order Hymenoptera. Insects in this order are the honey bee, wasp, hornet, yellow jacket and ant. The second is the Order Hemiptera. Certain insects in this order inflict a stinging sensation to the skin with their mouth parts. These insects include the wheel bug, assassin bug and ambush bug. Some of my friends call all insects bugs. Only the insects in the Order Hemiptera and Homoptera can be called true bugs; the rest are insects. Unless a person is highly allergic to stings, these can cause pain, but this passes with time.

Only the female of stinging insects has a stinger. The stinger or action part of the insect, is a modified ovipositor which is a saber-shaped device used for cutting slits in leaf material or wood to lay eggs. Many insects in the Hymenoptera have stingers but never bother man. They use them only for egg laying or stinging other insects. The shape of the ovipositor might be flat in cross section or it can be ellipital-shaped to round.

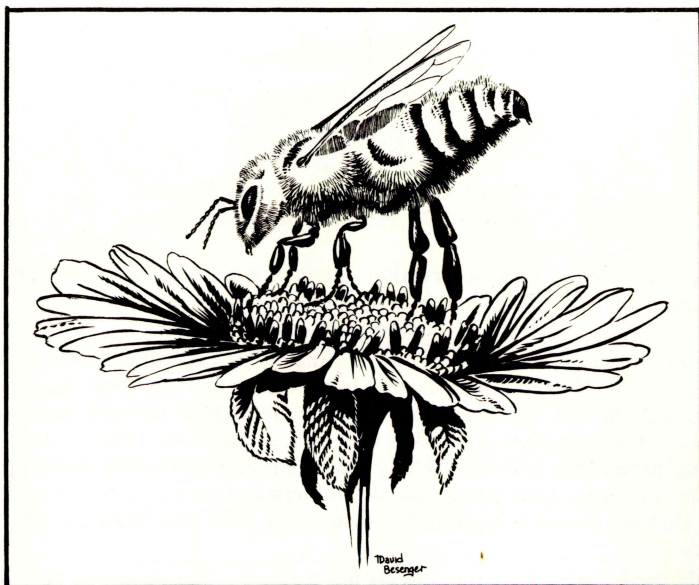
Some insects possess very long ovipositors, while others have the ability to withdraw or telescope their ovipositors within their abdomen.

During our encounters with stinging insects we see only a few representatives; there are thousands of different species of insects in the Order Hymenoptera, as well as Hemiptera.

Most stinging insects use plant material to feed upon and/or to build their nests. Many insects use other insects for food, to feed their young or to lay their eggs inside or on their body surface. Because many of our stinging insects spend their lives in galls or in paper cells in the soil we seldom or may never observe them. They are very reclusive. Some insects have a short egg stage and long larval stage but spend a very short time on earth as an adult.

Since stinging insects rely upon other insects for their development or food they are predators which are very beneficial to man. Many of the insects which are preyed upon are harmful or damaging to man's crops. One stinging insect might use 1,000 other insects during its life as food or as a place to develop from egg through the larval stage. To carry this one step farther, birds eat insects during the spring, summer and autumn. This further adds to reduction in numbers of insects which might be damaging to our crops. A difficult item to place a dollar gain on, but nevertheless, predation is a forceful fact of nature.

Many insects that feed on flowers to obtain valuable pollen aid in pollination of plants. The orchardist depends upon pollination of fruit trees by honey bees and other insects feeding upon the flowers. In fact, orchardists cease spraying their fruit trees to control damaging insects while pollination is taking place so that honey bees and other pollinating insects are not killed.



Honeybee

The Indians were unfamiliar with honeybees and they called them "the white man's fly." Honeybees have been widely distributed over the world by man. Of the many species of bees, the honeybee is the only one (with the exception of the pollinating activities of the bumblebee) of value to him. In fact, of the million or so kinds of insects, it is the only one utilized to any great extent by man for the production of food.

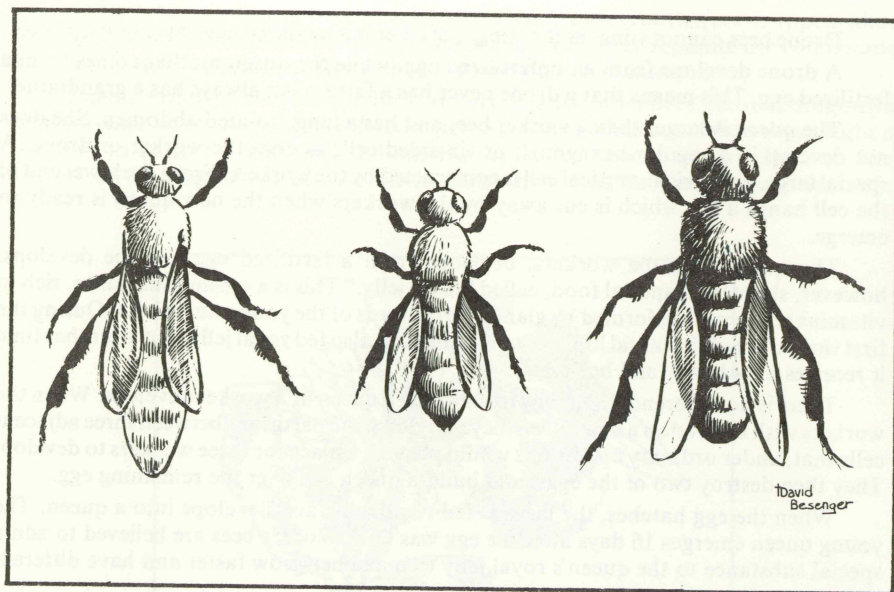
The honeybee, *Apis mellifera*, was used as early as 3633 B.C. by people of ancient Egypt. Records were found describing the process of extracting honey in the temple of Neuser-re, built around 2,600 B.C. The Colonists introduced honeybees into New England at least as early as 1640 to provide them with honey and wax. After 1670 bee culture declined in the colonies, probably due to a serious bee disease called American foul brood. There are now controls for foul brood which change periodically.

The Worker

Three castes of bees are found in a colony or hive; workers, drones, and queens. The workers are the well-known form that we see collecting pollen and nectar from flowers or entering and leaving the hive in large numbers. They make up the greater part of the hive; strong hives may have from 50,000 to 80,000 workers. Such bees are actually sexually undeveloped females. They do not normally lay eggs. As workers do not mate with males, the eggs they lay are unfertilized, and the unfertilized eggs produce only drones.

Eggs destined to be workers hatch three days after being laid by the queen. Five days after the larva hatches the cell in which it is growing, after first being provided with bee bread, a mixture of pollen and honey, is sealed over by a wax cover, or capped. Twenty days after the egg was laid the adult worker bites its way from the cell.

These bees are called "workers" because they perform the various duties about the hive. Their duties are related to their ages. Young workers are often called nurse bees, for they attend to the work inside the hive, which includes caring for the young bees, or brood, building comb, the hive and protecting the entrance against robbers. As they get older, usually when about 10 to 14 days of age, they become field bees, and go into the fields to collect pollen, nectar and propolis, a sticky material made from the resin of plants such as cottonwood.



The honeycomb, which consists of a mass of six-sided cells, is a marvel of engineering. Though the walls are only one-eightieth of an inch in thickness, they can support thirty times their own weight. When wax is needed, masses of workers gorge themselves with honey, hold to each other, and hang like a curtain from some support within the hive, the lower bees holding to the bees above them. After about twenty-four hours flakes of wax, usually eight at a time, are secreted from wax pockets on the ventral side of the abdomen of each worker. Other bees gather the wax flakes and use them to build more honeycomb or to cap cells containing brood or honey.

The workers spend much of their time collecting nectar, from which the honey is made. Nectar is a thin, sugary solution produced by special glands on flowers, called nectaries. Workers suck up the nectar with their long tongues and store it in their honey stomachs. When their stomachs are full, they return to the hive, where they either give it to another bee or put it in an empty cell. Certain chemicals are added to the nectar when it is in the worker's stomach. Excess water is evaporated in the honeycomb, and the chemicals secreted by the bee changes the nectar to honey. Workers then put a wax cap on the cell.

Though anyone who has been stung by a bee may not agree, bees do not normally sting unless frightened or hurt. Should you be stung, quickly scrape away the stinger, which usually remains embedded in the flesh. The poison sac also tears away from the bee, and will continue to pump venom into the wound unless quickly removed. It is also a good thing to remember that bees, like many people, are more ill-tempered in bad weather than they are on warm, sunny days.

Honeybees air condition their hives by fanning the entrance with their wings, so that temperatures in the hive very seldom exceed 93°F.

Drones

Male bees are called drones, and develop in larger cells than do workers. Drones are broader, and have blunter abdomens than do workers. There are never many drones present in a hive, and they are usually present only in the early summer. They do not work, and serve only to mate with a new queen during swarming. The workers are intolerant of any of their number that do not contribute to the welfare of the hive, and after the swarming season is over the "gentlemen of leisure" are driven from the hive to freeze or starve, or are stung to death and their bodies unceremoniously dragged from the hive and dropped to the ground outside.

Drone bees cannot sting, as the stinger of a bee is a modified egg-layer or ovipositor.

A drone develops from an unfertilized egg, while the queen mother comes from a fertilized egg. This means that a drone never has a father, but always has a grandfather.

The *queen* is larger than a worker bee, and has a long, pointed abdomen. She does not develop in a regular hexagonal, or six-sided cell, as does the worker or drone. A special large, cylindrical, vertical cell is constructed by the workers. From the lower end of the cell hangs a lid, which is cut away by the workers when the new queen is ready to emerge.

The queen, like the workers, develops from a fertilized egg. As she develops, however, she is fed a special food, called "royal jelly." This is a creamy substance, rich in vitamins and proteins, formed by glands in the heads of the young nurse bees. During the first three days of the larval life of a worker bee it is also fed royal jelly, but after that time it receives only honey and bee bread.

There is no difference in the egg from which a queen or a worker develops. When the workers wish to develop a new queen they tear down the partitions between three adjacent cells that, under ordinary conditions would provide a place for three workers to develop. They then destroy two of the eggs, and build a queen cell over the remaining egg.

When the egg hatches, the larva is fed royal jelly, and develops into a queen. The young queen emerges 16 days after the egg was laid. Worker bees are believed to add a special substance to the queen's royal jelly to make her grow faster and have different appearance from the workers.

During the summer months only one queen is usually present in the hive. In early summer workers often start several queen cells in the colony. If the old queen finds one of these, she immediately kills the developing queen. However, if the hive becomes too crowded, the queen becomes too old, or ceases to lay fertilized eggs, the workers may carefully keep her away from the queen-to-be. The old queen then takes a large number of her "subjects" and swarms out, and they go forth to start a new colony. Some workers will stay behind in the old hive in order to care for the larvae and the new queen.

Before the swarm leaves the hive, several workers seek a location for the new colony. Scouts may find an empty box, a hollow tree, or a hole in a wall. Once in a while the swarm may settle on a branch or post and build the hive exposed to the weather.

The young virgin queen, who is left behind in the old hive, will take a mating flight, accompanied by several drones. After mating she will return to the hive and start laying eggs two days later. After mating she may lay fertile eggs for the rest of her life. A queen may live as long as five years. She may lay 2,000 eggs a day, more than 200,000 in a single season, and up to 1,000,000 eggs in her lifetime.

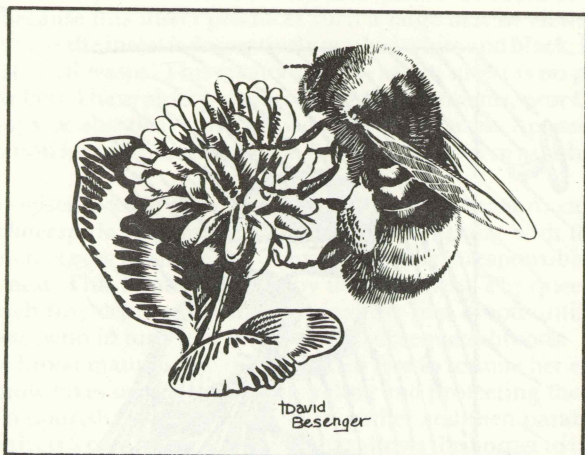
The swarming of the honeybee is essential to the continued existence of the species, for in social insects it is as necessary for the colonies to be multiplied as it is for there to be reproduction of individuals. Otherwise as the colonies were destroyed the species would become extinct.

Unlike bumblebees, where the colonies break up in the fall and only the young queens survive over the winter, the habits of the honeybee to store food for the winter, the ability to provide a new queen if needed, and the types of places chosen for habitation makes it possible for a honeybee colony to exist almost indefinitely. Thus if old and young queens lived together there would be no production of new colonies. We may then see that what appears to be merely jealousy on the part of the queen honeybee is actually an instinctive act necessary to provide for the continuance of the species.

The queen has a powerful stinger, but it is seldom used except against a rival queen. Should several queens mature and emerge at the same time, there will be a battle to the death to see who reigns over the hive. The last living queen becomes the ruler. She is the force that holds the colony together.

The workers never interfere with the grim battle unless both queens appear about to administer the coup-de-etat at the same time. Then they separate the combatants, only to let them resume the fight until but one queen remains.

Enemies of the honeybee are the bear, certain ants, other bees, skunks, dragonflies and the wax moth. An insect called the bee assassin catches bees when they alight on flowers to collect nectar and pollen. Pesticides can also have an effect on bees. American foul brood is a disease which turns the young bees into a gummy, lifeless mass.



The bumblebee nests in the soil.

The BumbleBee

The bumblebee is one of our largest native stinging insects. Probably the largest is the cicada-killer wasp, *Sphecius speciosus*, which can attain a length of 2 inches.

The common bumblebee that most of us see is *Bombus pennsylvanicus*, a large, stocky, fuzzy, black and yellow insect with light amber-colored wings about 1 inch long. The bumblebee has a habit of circling its nest which is in the soil after a disturbance such as a passing lawn mower. Eventually, many bees circle the nest until the source of irritation is discovered, at which time the main target is zeroed in on and the force attacks.

The bumblebee is frequently confused with the carpenter bee. The two bees are about the same size, however the abdomen of the carpenter bee is a metallic blue.

The bumblebee is a social insect; that is, a family nest is made and the older daughters do not mate but give their attention to caring for the nest and feeding their younger brothers and sisters.

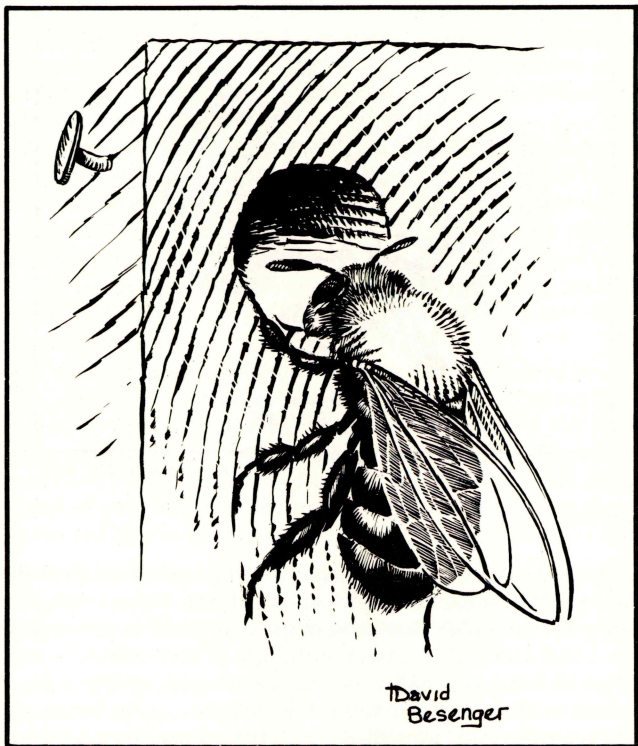
The fertilized female, or queen, passes the winter in some snug retreat and early in spring starts her nest. It may be in a deserted field-mouse's burrow or other cavity or opening in the soil. After arranging dried grass and the like to form the nest, she collects pollen and makes a pile of it, moistened with honey, on the floor of the nest. She also makes a honey-pot of wax near the doorway and fills it with rather liquid honey. Eggs are laid on the pollen-mass, covered with wax, or more or less incubated by the queen, especially during inclement weather. At such times she feeds out of the honey pot.

When the larvae hatch, they feed on the pollen mass under the waxen coverlet, which the mother pierces from time to time in order to give them special meals of honey and pollen, chewed up together. When the larvae have attained full size, in 10 days to two weeks, each spins a thin, papery, but tough, oval cocoon and pupates, the

queen brooding on the cocoons and sipping from her honey-pot. In a week or two the first workers emerge and take up the household duties. Workers are females but smaller than queens; males and queens are not born until late in the season.

Bumblebees play an important role in fertilization of certain flowers, such as those of the red clover, in which the flower is so-shaped that the nectar cannot be reached by bees with shorter tongues.

Because nests are constructed in cavities in the soil they can be fair game for mice or other small burrowing rodents.



The carpenter bee builds its nest in wood.

Carpenter Bee

As I entered my garage one morning recently, I noticed a shallow pile of "sawdust" on the ground beneath a main beam of the roof. I looked directly above the sawdust and discovered a neatly bored hole into a piece of treated timber about 3/4-inch in diameter. I knew at first glance that this was the work of none other than the carpenter bee, *Xylocopa virginica*. The carpenter bee will build its chambers in pine, fir, Eastern red cedar and a number of other types of wood.

The large carpenter bee makes its nest in solid wood. These are robust bees about an inch in length and similar in appearance to bumble bees. In tangential cross section, the nest is 3/4-inch wide and separated by one or two crosswalls. The female carpenter bee does possess a stinger and will sting when disturbed.

I have never known of a situation where carpenter bee activity was so heavy that structural integrity of a timber was reduced. If control is important, place a wasp-hornet spray in the opening and cover the hole with putty.

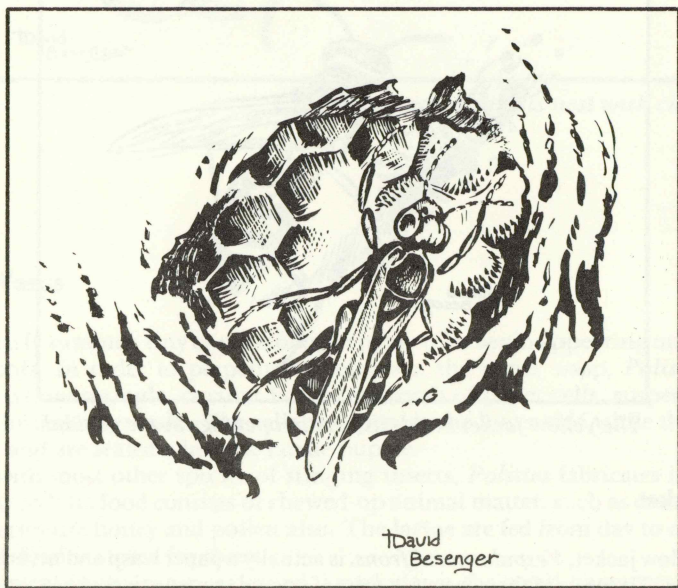
Bald-faced Hornet

The bald-faced hornet brings back memories. Not too many years ago I observed a bald-faced hornet's nest on the side of a garage in southeast Missouri. It was the usual grey nest with lighter horizontal striations but it was plastered on the side of the garage and the size of a bushel basket. The bald-faced fury will usually create this masterful piece of engineering in the top of a tree. Size of the nest will depend upon the age of the nest, but most nests are football size and shape. By the end of summer the abandoned nest often becomes a prize to collectors for their den or rec room or even to be sold.

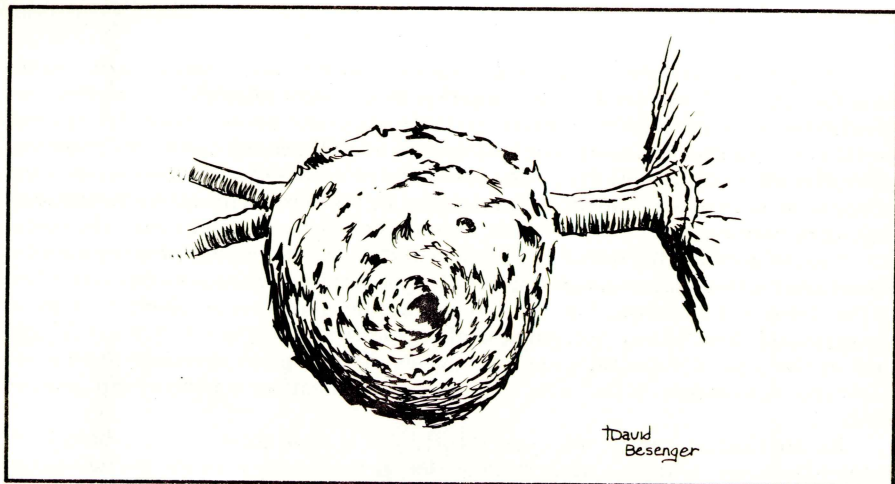
Simply because this insect produces such a large nest in view of everyone who passes and because the insect is decoratively marked white and black, I would classify it as the classiest of all wasps. This creative, stocky, alert, insect is no piker; it can stand up against the best. I have observed nests along Ozark streams, near Ozark witch hazel and in the tops of shortleaf pine trees on dry ridge tops. Apparently there is no preferred location for nest building, nor is there any set pattern as to how high nests are built.

Entomologists, people who study insects as a profession, call the bald-faced hornet *Dolichovespula maculata*. Life begins in the spring with the overwintering queen hornet emerging from the soil or rotten log. She is responsible for building the initial small nest. This is later replaced by the large nest. The queen hornet will lay one egg in each tiny depression. She will feed the first brood until it develops into worker hornets, who in turn feed the larvae of subsequent broods.

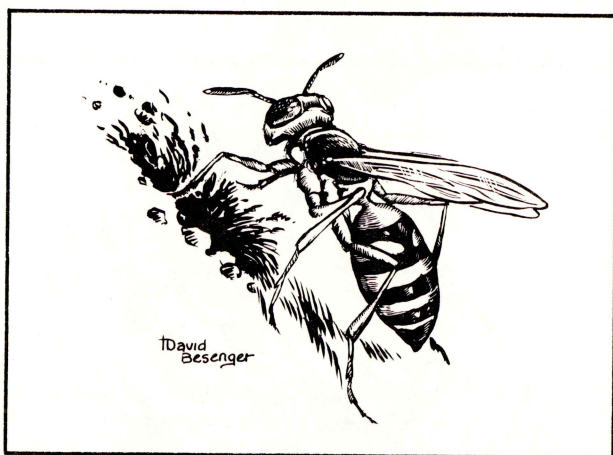
Once the brood matures, the queen is then free to resume her egg-laying duties. The worker now takes up her role of expanding and protecting the nest and feeding the larvae. To nourish larvae, workers must gather and then paralyze other insects. The stinger injects a paralyzing substance that allows the hornet to take the immobile form to the hungry brood.



The bald-faced hornet constructs its paper nest above ground in trees.



To correctly collect and preserve a bald-faced hornet nest, wait until early November after several hard frosts. Remove the nest and place moth crystals in the opening and plug the hole with cotton. This will fumigate any adult wasps still in the nest and also control any small beetles that might infest the nest in order to feed on other insect remains.



The yellow jacket builds its nest in openings in the ground.

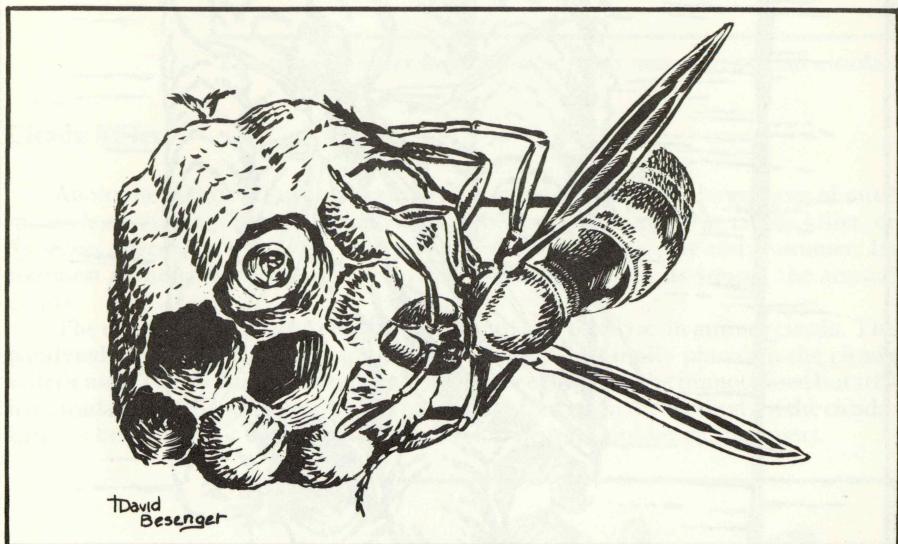
Yellow Jacket

The yellow jacket, *Vespula maculifrons*, is actually a paper wasp and nests in cavities in the ground. The nests of these wasps consist of several to many tiers of hexagonal paper cells all enclosed in a papery envelope. The nest is constructed from chewed wood.

The adult is black with yellow markings and numbers might vary from 15 to 30 per nest.

Warm dry summers are ideal for development of soil nesting stinging insects. Nest flooding is not a serious problem to insect development. From personal experience, when a loud noise, such as a lawn mower, is close to a yellow jacket nest, insects are attracted by the noise and attack. If the lawn mower operator gets by without more than five stings, he or she is fortunate.

In wild areas, where yellow jackets are not a nuisance, they should not be disturbed because of their predaceous habits on other harmful insects. In a lawn or other area frequented by humans, the nest should be destroyed. This can be accomplished by waiting until dusk, when insect activity is low, and then flooding the nest in the soil with a wasp-hornet spray. When all insect activity ceases, carefully dig up the area containing the nest and smash the paper nest to kill all stages of the insect present.



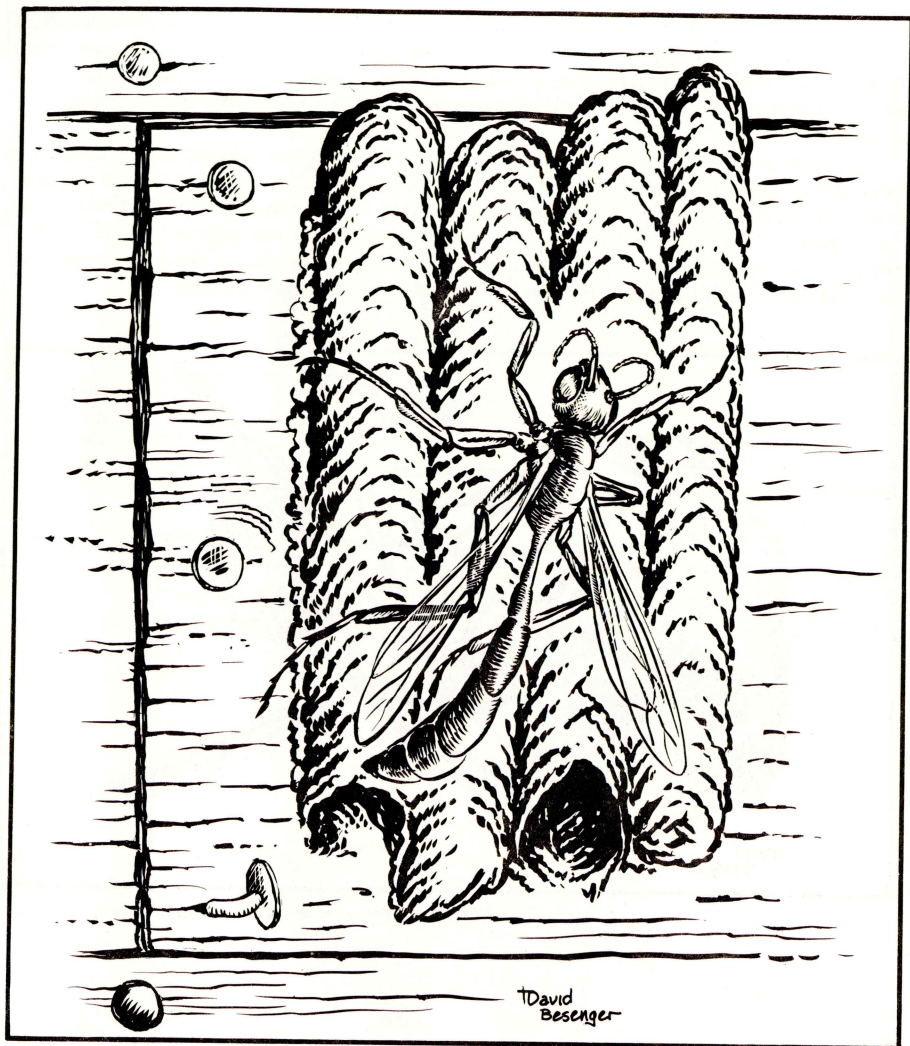
The paper wasp makes its nest with chewed wood.

Paper Wasps

By early summer, tiny clumps of tight paper cells begin appearing on the eaves of house roofs. In order to perpetuate their own, the paper wasp, *Polistes fuscatus pallipes* creates a single, circular horizontal comb of paper cells, suspended from a support by a slender stalk. The cells are open on the lower side while the larvae are growing and are sealed when the larvae pupate.

As with most other species of stinging insects, *Polistes* fabricates its nest from chewed wood. Its food consists of chewed-up animal matter, such as caterpillars, but some species use honey and pollen also. The larvae are fed from day to day, or more often. No food is stored for them.

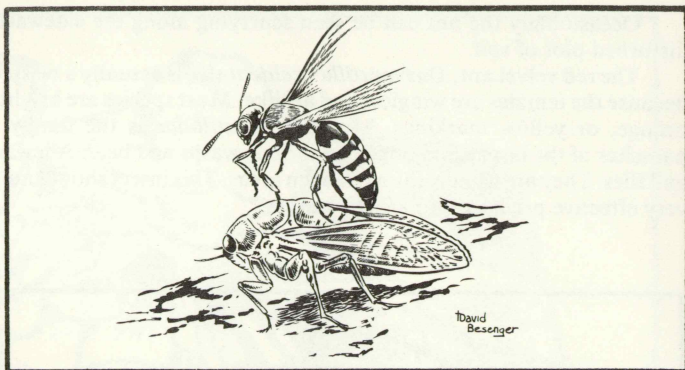
If control of this wasp is desired, knock down the small paper nest before it is enlarged. If the nest is large and many wasps are present direct wasp-hornet spray on the nest in the evening when activity is low. When insects are killed, remove the nest and step on it and place in trash can.



The mud-dauber male guards the nest while the female is away.

Mud-dauber

The mud-dauber, *Trypargilum clavatum* is an elongate, slender, usually shiny black wasp. Mud-daubers vary in length from about 1/2-inch to 1 inch or more. Some species make their nests of mud, with the cells arranged in the form of a long tube, hence the common name for this group. In species that construct this type of nest, the male usually guards the nest while the female is absent. These wasps provision their nests with spiders. These wasps are also beneficial to man in that they control spider populations. However, if a nest location is threatening to humans, the mud nest should be destroyed while it is small. A large nest should be first sprayed and then destroyed.

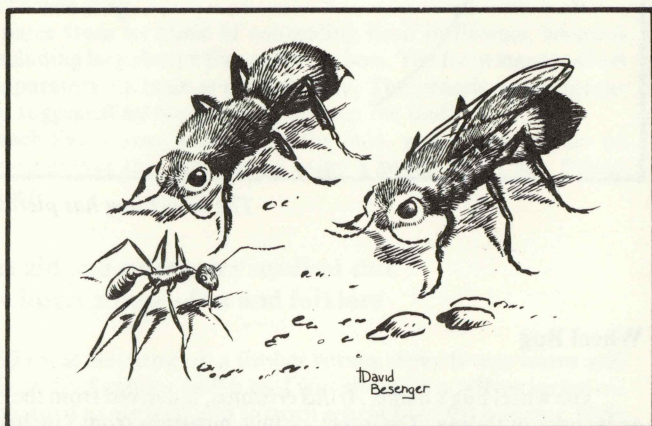


The cicada—killer wasp provisions its nest with annual cicadas.

Cicada Killer

About the middle of July we begin to receive inquiries about a large wasp, about 2 inches long that is yellow and black with amber colored wings. The cicada killer, or *Sphecius speciosus*, builds its nest in underground burrows in early summer. Its common name is derived from the insects which it feeds to its young, the annual cicada.

The cicada killer is large enough to seek out and paralyze an annual cicada. The paralyzed cicada is then flown to the nest opening and finally placed in the cicada killer's nest. The cicada killer female then lays her eggs upon the immobilized but still live cicada. After the young wasp eggs hatch, they feed upon the live body of the cicada. Little is known about the details of the development or biology of this insect.



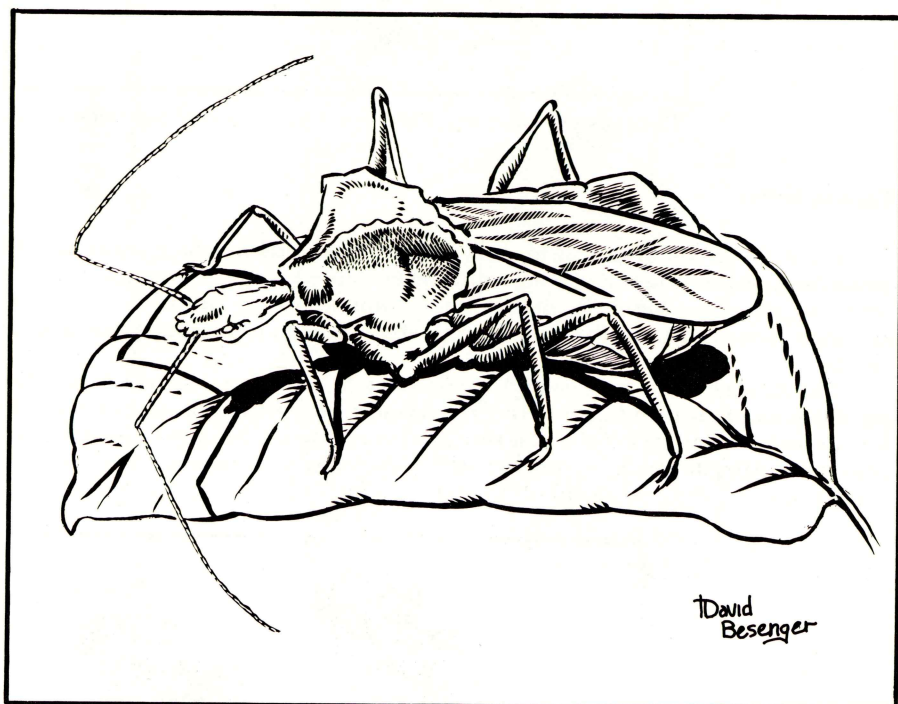
The red velvet ant is colored red and black. The male is winged.

Red Velvet Ant

The red velvet ant makes its appearance in late summer. The adult male is slightly larger than the female (about 1 inch long) and possesses two sets of wings. The striking feature of this ant is its red and black velvety markings; thus the name red velvet ant. The female possesses a fairly short stinger or ovipositor which is not barbed as in the honeybee. The sting is very painful.

Occasionally the ant can be seen scurrying along the sidewalk into the garden or disturbed plot of soil.

The red velvet ant, *Dasymutilla occidentalis*, is actually a wasp but it is called an ant because the females are wingless and antlike. Most species are brightly colored, with red, orange, or yellow markings. Mutillids (*Mutillidae* is the family name) are external parasites of the larvae and pupae of various wasps and bees. A few attack certain beetles and flies. They are usually found in open areas. This insect should not be disturbed—it is a very effective predator of harmful insects.



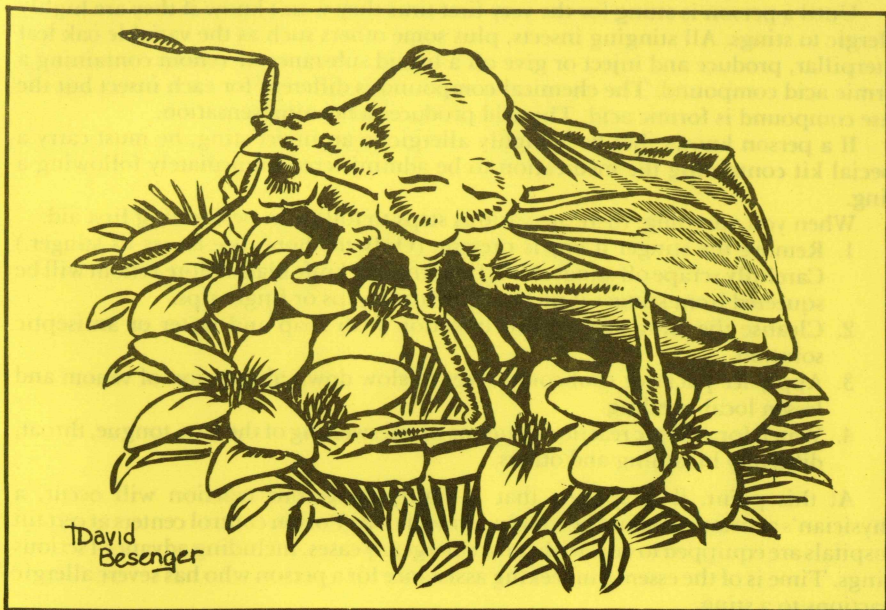
The wheel bug has piercing sucking mouth parts.

Wheel Bug

The wheel bug's name, *Arilus cristatus*, is derived from the raised gearlike projection on its back or thorax. The insect, or bug, measures from 1 inch to 1.5 inches in length and is generally grayish black or slightly bronzed. The young, called nymphs, are red with black marks at hatching time.

The action part of this bug is its mouth. Sheathed within the long, needlelike mouthpart are four sharp, tiny needles which are bared and jabbed alternately into the host flesh, be it human skin or the skin of a caterpillar. Insect saliva is sent to the host and mixed with it. The wheel bug then extracts the body fluids from the host caterpillar in a digestable form.

The wheel bug is our friend. It should not be disturbed as it is a very effective insect predator.



The ambush bug has powerful front legs to grab unsuspecting insects.

Ambush Bug

The ambush bug, *Phymata facciata georgiensis*, is in the same order as the wheel bug, (Hemiptera). The ambush bug is yellow with black markings and is a rather blunt, stoutish insect, less than 1/2-inch long.

This bug derives its name from its habit of concealing itself in flowers, where it captures various insects, including large butterflies and even bees. The front legs are short but very powerful, and apparently its beak is quite deadly. The generic name means "tumor" and was probably suggested by the projections from the body.

Unless you handle much living plant material in the field, you may never see an ambush bug. A good way to collect this insect is by using a sweep insect net. Sweep goldenrod flowers in summer.

First aid and emergency medical care for insect stings—fact and folklore

In the summer of 1960 I was assisting on a timber survey crew. It was warm and dry and I was perspiring heavily. At about 3:00 p.m. I was stung by a yellow jacket on my left hand. I was able to return to my jeep and to town where I visited a doctor. I felt dizzy and very tired and returned home and went to bed.

While in the field I tried a remedy still used by many Ozark natives. Old Utah, an axeman on the survey crew, withdrew a portion of his chew and placed it on the reddening sting area. Wet chewing tobacco is supposed to have a drawing, healing quality when placed and left on a sting for an hour or so.

People have also had success with wet mud, treating the sting area in a similar way. The "poultice" type treatment has been successful for curing many types of stings and skin problems, such as burns and abrasions, for many years.

If you are preparing for a trip outdoors you will want to be aware of recent medical recommendations for treating stings.

Until a person is stung for the very first time they won't know if they are highly allergic to stings. All stinging insects, plus some others such as the variable oak leaf caterpillar, produce and inject or give off a liquid substance or venom containing a formic acid compound. The chemical compound is different for each insect but the base compound is formic acid. The acid produces a burning sensation.

If a person knows that he is highly allergic to an insect sting, he must carry a special kit containing the medication to be administered immediately following a sting.

When you are stung, there are various steps to follow in performing first aid.

1. Remove the stinger if one is present. (Only the honeybee leaves its stinger.) Carefully scrape off stinger with fingernail or knife blade. More venom will be squeezed from stinger if picked off with forceps or finger tips.
2. Cleanse the sting site against infection with soap and water or antiseptic solution.
3. Apply ice packs or cool compresses to slow down absorption of venom and lessen local swelling.
4. Watch for allergic reactions, such as hives, swelling of the face, tongue, throat, difficulty breathing and others.

At this point, if it appears that a highly dangerous reaction will occur, a physician's assistance should be sought immediately. Poison control centers at certain hospitals are equipped to deal with most emergency cases, including advanced serious stings. Time is of the essence in seeking assistance for a person who has severe allergic reactions to a sting.

Other insects that sting or bite include various species of ants, mosquitoes, flies, sweat bees, and the stinging hairs of the saddleback caterpillar and Io moth larvae.

I have drawn freely upon various sources of entomological references. They are listed as follows:

1. *An Introduction to the Study of Insects*, by D.J. Borror and D.M. DeLong, 3rd edition Holt, Rinehart and Winston
2. *Fieldbook of Insects* by Frank E. Lutz, 2nd edition, G.P. Putnam's Sons (Out of print)
3. *Stinging and Biting Pests*, by Dr. Wilfred S. Craig, Department of Entomology, College of Agriculture, University of Missouri, Columbia. (Available from your local University Extension Office)
4. *First Aid and Emergency Medical Care for Insect Stings*, Personnel of U.S.D.A., Forest Service Equipment Development Center, Fort Missoula, Montana 59801 (not available)
5. *Bees*, by Robert J. Boles, The Kansas School Naturalist, Kansas State Teachers College, Emporia, Kansas, Vol. 10, No. 1, October 1969 (out of print)

There are many other sources where additional information can be obtained on stinging insects such as a school library, local and regional libraries and book stores that deal with nature guide books.